

Honeywell Docket No. H0003298 US - 4018
Buchalter Docket No.: H9925-2405

Inventor: **Zhou et al.**
Serial No.: **10/511454**
Filed: **October 12, 2004**
For: **THERMALLY CONDUCTIVE
COATING COMPOSITIONS,
METHODS OF PRODUCTION
AND USES THEREOF**

Examiner: **Kuo L. Peng**
Art Unit: **1712**

MAIL STOP APPEAL BRIEF – PATENTS
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APPELLANT'S BRIEF UNDER 37 CFR § 41.37

This brief follows the appellant's Notice of Appeal filed in this case on May 21, 2007. The deadline for the brief fell on July 21, 2007, which was a Saturday, and therefore, this brief is timely filed on Monday, July 23, 2007. The fees required under 37 CFR §1.17(f) are included with this brief.

This brief contains the following items under the headings in the order here indicated:

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REAL PARTY IN INTEREST

The real party in interest is the assignee, Honeywell International Inc. (see Reel/Frame No. 014748/0566, Recorded on June 18, 2004)

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences in this matter known to appellant.

STATUS OF THE CLAIMS

There are 64 claims in this case. Claims 1-64 are pending. Claims 1-64 were rejected as of the Final Office Action dated April 17, 2007. Claims 1-64 are being appealed.

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to final rejection in this matter.

SUMMARY OF THE CLAIMED SUBJECT MATTER

The subject matter of the present application, including independent claims 1 and 35, is directed to thermally conductive coating compositions and material in electronic components, semiconductor components and other related layered materials applications.

A thermal interface composition is described in the application that includes: a) at least two siloxane-based compounds (page 8, lines 26-27, page 9, lines 1-22 and page 11, lines 9-17); b) at least one inorganic micro-filler material (page 11, lines 18-28, page 12, lines 1-3); and c) at least one thermally conductive filler material (page 12, lines 4-15).

Additionally, a method of forming a thermal interface material is disclosed herein that includes: a) providing at least two siloxane-based compounds (page 17, lines 16-26); b) providing at least one inorganic micro-filler material (page 17, lines 16-26); c) providing at least one thermally conductive filler material (page 17, lines 16-26); and d) combining the at least two siloxane-based compounds, the at least one inorganic micro-filler material and the at least one thermally conductive filler material (page 18, lines 1-25).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-10, 12-20, 25-44, 46-55 and 59-64 are rejected under 35 USC §102(e), as being anticipated by Matayabas (US 6469379).

Claims 1-14, 16, 18-20, 22-23, 25-48, 50, 52-57 and 59-64 are rejected under 35 USC §102(b), as being anticipated by Mine et al (US 6040362).

Claims 1-15, 17-26, 35-49 and 51-60 are rejected under 35 USC §102(b), as being anticipated by Theodore (US 4292225).

Claims 1-5, 8-10, 12-15, 17-18, 25-39, 43-44, 46-49, 51-52 and 59-64 are rejected under 35 USC §102(b), as being anticipated by Hanson (US 5950066).

Claims 21, 24, 55 and 58 are rejected under 35 USC §103(a) as unpatentable over Matayabas (US 6469379).

Claims 22 and 56 are rejected under 35 USC §103(a) as unpatentable over Matayabas (US 6469379) in view of Mine et al (US 6040362).

Claims 21 and 55 are rejected under 35 USC §103(a) as unpatentable over Hanson (US 5950066).

Claims 16 and 50 are rejected under 35 USC §103(a) as unpatentable over Hanson (US 5950066) in view of Matayabas (US 6469379).

ARGUMENT

ISSUE No. 1 - §102(E) REJECTION OF CLAIMS BASED ON MATAYABAS

Claims 1-10, 12-20, 25-44, 46-55 and 59-64 are rejected under 35 USC §102(e), as being anticipated by Matayabas (US 6469379). The Applicant respectfully disagrees.

Claim 1 recites:

"A thermal interface composition, comprising:

at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

at least one inorganic micro-filler material, and

at least one thermally conductive filler material."

Claim 35 recites:

"A method of forming a thermal interface material, comprising:

providing at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

providing at least one inorganic micro-filler material,

providing at least one thermally conductive filler material, and

combining the at least two siloxane-based compounds, the at least one inorganic micro-filler material and the at least one thermally conductive filler material."

Matayabas teaches a curable material useful as a thermal interface material comprising at least one vinyl-terminated silicone oil; at least one conductive filler; and at least one hydrogen terminated silicone oil. It is instructive to note that in Column 7 of the reference, lines 55-65, Matayabas states that low molecular weight silicone oil is beneficial to use in conjunction with the high molecular weight silicone polymers. This mixture apparently helps both the crosslinked polymer and the wettability. (see Column 5, lines 55-65)

In the current application, the Background Section states that:

"Suitable base materials used in GELVET®-type of applications and other similar applications are those materials that are compliant and yet strong, while ideal base materials are those materials that are not only compliant and strong, but also can be produced with a high degree of purity. Silicone is one of the best available polymers identified as a base material because of its compliant property and strength. However, it is well known that a considerable amount of volatile, low molecular weight components are present inherently as a consequence of the equilibrium polymerization utilized in silicon manufacture. Typically, silicones with viscosity below 50cSt are more than 10% volatile, while those with a viscosity greater than 50cSt are 0.5-4% volatile. After curing, liquid silicone monomers convert into a solid or semi-solid rubbery state polymer and the cross-linked network can then reduce the migration of liquid friction. Though a certain amount of monomers and oligomers will unavoidably escape out of the bulk base under the harsh burn-in conditions, resulting in an oily organic stain on the surface of IC chips. The contamination not only cosmetically stains the chip surface but also degrades the chip's thermal performance after packaging. **So-called "space-grade" silicone has the least amount of low molecular weight oligomers by repeatedly distillation of industrial grade and accordingly is very expensive.**" (emphasis added)

In the application, as mentioned, a coating material and/or composition has been developed that that a) has a low thermal resistance; b) is relatively free of oil contamination; c) makes a good coating composition; and d) can make a self-assembled physical barrier or interface between the underlying thermal interface material and additional components. Furthermore, the self-assembled physical barrier is formed inside the coating composition, utilizing a micro-filler and phase separation of two silicone based macro-monomers, which will subsequently be crosslinked to form a coating base. The at least two siloxane-based polymers of the current application should have two different solubility parameters. This provision cannot just be assumed to be true in Matayabas, especially since Matayabas doesn't teach that the silicone oils have different solubility parameters or separate into two distinct phases after blending, and since Matayabas states that low molecular weight silicone oil is beneficial to use in conjunction with the high molecular weight silicone polymers. This mixture apparently helps both the crosslinked polymer and the wettability. (see Column 5, lines 55-65)

Matayabas does not teach all of the claimed elements of the present application.

"Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration." *W. L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983) (citing *Soundscriber Corp. v. United States*, 360 F.2d 954, 148 USPQ 298, 301 (Ct. Cl.), *adopted*, 149 USPQ 640 (Ct. Cl. 1966)) Further, the prior art reference must disclose each element of the claimed invention "arranged as in the claim". *Lindermann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984)(citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)). Matayabas teaches the crosslinking of a large and small siloxane oil. The present application teaches utilizing a phase separated siloxane composition that can be crosslinked to form, among other things, a protective barrier. These two disclosures are not the same, and certainly Matayabas cannot anticipate claim 1 or claim 35 of the present

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application. In addition, claims 2-10, 12-20, 25-34, 36-44, 46-55 and 59-64 are allowable by virtue of their dependency on claims 1 and 35, respectively.

ISSUE NO. 2 - §102(B) REJECTION OF CLAIMS BASED ON MINE ET AL.

Claims 1-14, 16, 18-20, 22-23, 25-48, 50, 52-57 and 59-64 are rejected under 35 USC §102(b), as being anticipated by Mine et al (US 6040362). The Applicant respectfully disagrees.

Claim 1 recites:

“A thermal interface composition, comprising:

at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

at least one inorganic micro-filler material, and

at least one thermally conductive filler material.”

Claim 35 recites:

“A method of forming a thermal interface material, comprising:

providing at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

providing at least one inorganic micro-filler material,

providing at least one thermally conductive filler material, and

combining the at least two siloxane-based compounds, the at least one inorganic micro-filler material and the at least one thermally conductive filler material.”

Mine et al. does not anticipate the claims of the present application, because Mine does not recite at least two siloxane-based compounds, wherein each compound has a different solubility parameter. Anticipation generally requires the disclosure in a single prior art reference of each element of the claim under consideration. Further, the prior art reference must disclose each element of the claimed invention arranged as in the claim. Mine does not teach a thermal interface material or a method of making a thermal interface material comprising at least two siloxane-based compounds, wherein each compound has a different solubility parameter.

Although the Examiner contends that he has a "reasonable basis" to believe that the compounds disclosed in Mine have different solubility parameters, there is no evidence in Mine to suggest that the inventors in Mine dealt with or intended for a phase separation to take place between the components. In the present application, **that phase separation is specifically required.** The Examiner is required to specifically show where in Mine the inventors have a phase separated composition comprising the two components or at the very least suggest that the option is possible.

Based on this argument, Mine does not anticipate claims 1 or 35 of the present application because Mine is lacking and/or missing at least one specific feature or structural recitation found in the present application, and in claims 1 and 35. Claims 1 and 35 are therefore allowable as not being anticipated by Mine. Further, Mine does not anticipate claims 2-14, 16, 18-20, 22-23, 25-34, 36-48, 50, 52-57 and 59-64 of the present application by virtue of their dependency on claims 1 and 35, respectively.

ISSUE NO. 3 - §102(B) REJECTION OF CLAIMS BASED ON THEODORE

Claims 1-15, 17-26, 35-49 and 51-60 are rejected under 35 USC §102(b), as being anticipated by Theodore (US 4292225). The Applicant respectfully disagrees.

Claim 1 recites:

“A thermal interface composition, comprising:

at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

at least one inorganic micro-filler material, and

at least one thermally conductive filler material.”

Claim 35 recites:

“A method of forming a thermal interface material, comprising:

providing at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

providing at least one inorganic micro-filler material,

providing at least one thermally conductive filler material, and

combining the at least two siloxane-based compounds, the at least one inorganic micro-filler material and the at least one thermally conductive filler material.”

Theodore et al. does not anticipate the claims of the present application, because Theodore does not recite at least two siloxane-based compounds, wherein each compound has a different solubility parameter. Anticipation generally requires the disclosure in a single prior art reference of each element of the claim under consideration. Further, the prior art reference must disclose each element of the claimed invention arranged as in the claim. Theodore does not teach a thermal interface material or a method of making a thermal interface material comprising at least two siloxane-based compounds, wherein each compound has a different solubility parameter.

Although the Examiner contends that he has a "reasonable basis" to believe that the compounds disclosed in Theodore have different solubility parameters, there is no evidence in Theodore to suggest that the inventors in Theodore dealt with or intended for a phase separation to take place between the components. In the present application, that phase separation is specifically required. The Examiner is required to specifically show where in Theodore the inventors have a phase separated composition comprising the two components or at the very least suggest that the option is possible.

Based on this argument, Theodore does not anticipate claims 1 or 35 of the present application because Theodore is lacking and/or missing at least one specific feature or structural recitation found in the present application, and in claims 1 and 35. Claims 1 and 35 are therefore allowable as not being anticipated by Theodore. Further, Theodore does not anticipate claims 2-15, 17-26, 36-49 and 51-60 of the present application by virtue of their dependency on claims 1 and 35, respectively.

ISSUE No. 4 - §102(b) REJECTION OF CLAIMS BASED ON HANSON

Claims 1-5, 8-10, 12-15, 17-18, 25-39, 43-44, 46-49, 51-52 and 59-64 are rejected under 35 USC §102(b), as being anticipated by Hanson (US 5950066). The Applicant respectfully disagrees.

Claim 1 recites:

"A thermal interface composition, comprising:

at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

at least one inorganic micro-filler material, and

at least one thermally conductive filler material."

Claim 35 recites:

"A method of forming a thermal interface material, comprising:

providing at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

providing at least one inorganic micro-filler material,

providing at least one thermally conductive filler material, and

combining the at least two siloxane-based compounds, the at least one inorganic micro-filler material and the at least one thermally conductive filler material."

Hanson does not anticipate the claims of the present application, because Hanson does not recite at least two siloxane-based compounds, wherein each compound has a different solubility parameter. Anticipation generally requires the disclosure in a single prior art reference of each element of the claim under consideration. Further, the prior art reference must disclose each element of the claimed invention arranged as in the claim. Hanson does not teach a thermal interface material or a method of making a thermal interface material comprising at least two siloxane-based compounds, wherein each compound has a different solubility parameter.

Although the Examiner contends that he has a "reasonable basis" to believe that the compounds disclosed in Hanson have different solubility parameters, there is no evidence in Hanson to suggest that the inventors in Hanson dealt with or intended for a phase separation to take place between the components. In the present application, that phase separation is specifically required. The Examiner is required to specifically show where in Hanson the inventors have a phase separated composition comprising the two components or at the very least suggest that the option is possible.

Based on this argument, Hanson does not anticipate claims 1 or 35 of the present application because Hanson is lacking and/or missing at least one specific feature or structural recitation found in the present application, and in claims 1 and 35. Claims 1 and 35 are therefore allowable as not being anticipated by Hanson. Further, Hanson does not anticipate claims 2-5, 8-10, 12-15, 17-18, 25-34, 36-39, 43-44, 46-49, 51-52 and 59-64 of the present application by virtue of their dependency on claims 1 and 35, respectively.

ISSUE NO. 5 - §103(A) REJECTION OF CLAIMS BASED ON MATAYABAS

Claims 21, 24, 55 and 58 are rejected under 35 USC §103(a) as unpatentable over Matayabas (US 6469379). The Applicant respectfully disagrees.

Procedurally, this rejection is inappropriate for two reasons. First, all of the claims cited in the 103(a) rejections are dependent claims. Independent claims 1 and 35 are not cited as being obvious in view of these references – and therefore, they are allowable. Since they are allowable, the dependant claims to which they refer are also allowable. Second, claims are not obvious in view of only one reference, but instead in view of a combination of references. If there is only one reference cited, it should properly be cited as a reference which anticipates the claims cited and not renders obvious those same claims.

In order to expedite prosecution of this application, however, the Applicants will address the references. In the current application, the Background Section states that:

“Suitable base materials used in GELVET®-type of applications and other similar applications are those materials that are compliant and yet strong, while ideal base materials are those materials that are not only compliant and strong, but also can be produced with a high degree of purity. Silicone is one of the best available polymers identified as a base material because of its compliant property and strength. However, it is well known that a considerable amount of volatile, low molecular weight components are present inherently as a consequence of the equilibrium polymerization utilized in silicon manufacture. Typically, silicones with viscosity below 50cSt are more than 10% volatile, while those with a viscosity greater than 50cSt are 0.5-4% volatile. After curing, liquid silicone monomers convert into a solid or semi-solid rubbery state polymer and the cross-linked network can then

reduce the migration of liquid friction. Though a certain amount of monomers and oligomers will unavoidably escape out of the bulk base under the harsh burn-in conditions, resulting in an oily organic stain on the surface of IC chips. The contamination not only cosmetically stains the chip surface but also degrades the chip's thermal performance after packaging. **So-called "space-grade" silicone has the least amount of low molecular weight oligomers by repeatedly distillation of industrial grade and accordingly is very expensive."** (emphasis added)

In the application, as mentioned, a coating material and/or composition has been developed that that a) has a low thermal resistance; b) is relatively free of oil contamination; c) makes a good coating composition; and d) can make a self-assembled physical barrier or interface between the underlying thermal interface material and additional components. Furthermore, the self-assembled physical barrier is formed inside the coating composition, utilizing a micro-filler and phase separation of two silicone based macro-monomers, which will subsequently be crosslinked to form a coating base. The at least two siloxane-based polymers of the current application should have two different solubility parameters. The two solubility parameters allow the at least two siloxane-based polymers to separate into two distinct phases before the crosslinking reaction takes place. None of the cited references teach this phase separation, despite what the Examiner reasonably believes about the compounds taught in those references. In addition, one of ordinary skill in the art will not read any of the cited references and come away with the knowledge that utilizing different solubility parameters to form two distinct phases will be desirable for a thermal interface material.

Therefore, claims 1 and 35 are patentable over Matayabas. In addition, claims 21, 24, 55 and 58 are allowable as being dependant on allowable claims 1 and 35.

ISSUE NO. 6 - §103(A) REJECTION OF CLAIMS BASED ON MATAYABAS IN VIEW OF MINE

Claims 22 and 56 are rejected under 35 USC §103(a) as unpatentable over Matayabas (US 6469379) in view of Mine et al (US 6040362). The Applicant respectfully disagrees.

Procedurally, this rejection is inappropriate. All of the claims cited in the 103(a) rejection are dependent claims. Independent claims 1 and 35 are not cited as being obvious in view of these references – and therefore, they are allowable. Since they are allowable, the dependant claims to which they refer are also allowable.

In order to expedite prosecution of this application, however, the Applicants will address the references. In the current application, the Background Section states that:

“Suitable base materials used in GELVET®-type of applications and other similar applications are those materials that are compliant and yet strong; while ideal base materials are those materials that are not only compliant and strong, but also can be produced with a high degree of purity. Silicone is one of the best available polymers identified as a base material because of its compliant property and strength. However, it is well known that a considerable amount of volatile, low molecular weight components are present inherently as a consequence of the equilibrium polymerization utilized in silicon manufacture. Typically, silicones with viscosity below 50cSt are more than 10% volatile, while those with a viscosity greater than 50cSt are 0.5-4% volatile. After curing, liquid silicone monomers convert into a solid or semi-solid rubbery state polymer and the cross-linked network can then reduce the migration of liquid friction. Though a certain amount of monomers and oligomers will unavoidably escape out of the bulk base under the harsh burn-in conditions, resulting in an oily organic stain on the surface of IC chips. The

contamination not only cosmetically stains the chip surface but also degrades the chip's thermal performance after packaging. **So-called "space-grade" silicone has the least amount of low molecular weight oligomers by repeatedly distillation of industrial grade and accordingly is very expensive.**" (emphasis added)

In the application, as mentioned, a coating material and/or composition has been developed that that a) has a low thermal resistance; b) is relatively free of oil contamination; c) makes a good coating composition; and d) can make a self-assembled physical barrier or interface between the underlying thermal interface material and additional components. Furthermore, the self-assembled physical barrier is formed inside the coating composition, utilizing a micro-filler and phase separation of two silicone based macro-monomers, which will subsequently be crosslinked to form a coating base. The at least two siloxane-based polymers of the current application should have two different solubility parameters. The two solubility parameters allow the at least two siloxane-based polymers to separate into two distinct phases before the crosslinking reaction takes place. None of the cited references teach this phase separation, despite what the Examiner reasonably believes about the compounds taught in those references. In addition, one of ordinary skill in the art will not read any of the cited references and come away with the knowledge that utilizing different solubility parameters to form two distinct phases will be desirable for a thermal interface material.

Therefore, claims 1 and 35 are patentable over Matayabas in view of Mine. In addition, claims 22 and 56 are allowable as being dependant on allowable claims 1 and 35.

ISSUE No. 7 - §103(A) REJECTION OF CLAIMS BASED ON HANSON

Claims 21 and 55 are rejected under 35 USC §103(a) as unpatentable over Hanson (US 5950066). The Applicant respectfully disagrees.

Procedurally, this rejection is inappropriate for two reasons. First, all of the claims cited in the 103(a) rejections are dependent claims. Independent claims 1 and 35 are not cited as being obvious in view of these references – and therefore, they are allowable. Since they are allowable, the dependant claims to which they refer are also allowable. Second, claims are not obvious in view of only one reference, but instead in view of a combination of references. If there is only one reference cited, it should properly be cited as a reference which anticipates the claims cited and not renders obvious those same claims.

In order to expedite prosecution of this application, however, the Applicants will address the references. In the current application, the Background Section states that:

“Suitable base materials used in GELVET®-type of applications and other similar applications are those materials that are compliant and yet strong, while ideal base materials are those materials that are not only compliant and strong, but also can be produced with a high degree of purity. Silicone is one of the best available polymers identified as a base material because of its compliant property and strength. However, it is well known that a considerable amount of volatile, low molecular weight components are present inherently as a consequence of the equilibrium polymerization utilized in silicon manufacture. Typically, silicones with viscosity below 50cSt are more than 10% volatile, while those with a viscosity greater than 50cSt are 0.5-4% volatile. After curing, liquid silicone monomers convert into a solid or semi-solid rubbery state polymer and the cross-linked network can then

reduce the migration of liquid friction. Though a certain amount of monomers and oligomers will unavoidably escape out of the bulk base under the harsh burn-in conditions, resulting in an oily organic stain on the surface of IC chips. The contamination not only cosmetically stains the chip surface but also degrades the chip's thermal performance after packaging. **So-called "space-grade" silicone has the least amount of low molecular weight oligomers by repeatedly distillation of industrial grade and accordingly is very expensive."** (emphasis added)

In the application, as mentioned, a coating material and/or composition has been developed that that a) has a low thermal resistance; b) is relatively free of oil contamination; c) makes a good coating composition; and d) can make a self-assembled physical barrier or interface between the underlying thermal interface material and additional components. Furthermore, the self-assembled physical barrier is formed inside the coating composition, utilizing a micro-filler and phase separation of two silicone based macro-monomers, which will subsequently be crosslinked to form a coating base. The at least two siloxane-based polymers of the current application should have two different solubility parameters. The two solubility parameters allow the at least two siloxane-based polymers to separate into two distinct phases before the crosslinking reaction takes place. None of the cited references teach this phase separation, despite what the Examiner reasonably believes about the compounds taught in those references. In addition, one of ordinary skill in the art will not read any of the cited references and come away with the knowledge that utilizing different solubility parameters to form two distinct phases will be desirable for a thermal interface material.

Therefore, claims 1 and 35 are patentable over Hanson. In addition, claims 21 and 55 are allowable as being dependant on allowable claims 1 and 35.

ISSUE NO. 8 - §103(A) REJECTION OF CLAIMS BASED ON HANSON IN VIEW OF MATAYABAS

Claims 16 and 50 are rejected under 35 USC §103(a) as unpatentable over Hanson (US 5950066) in view of Matayabas (US 6469379). The Applicant respectfully disagrees.

Procedurally, this rejection is inappropriate. All of the claims cited in the 103(a) rejection are dependent claims. Independent claims 1 and 35 are not cited as being obvious in view of these references – and therefore, they are allowable. Since they are allowable, the dependant claims to which they refer are also allowable.

In order to expedite prosecution of this application, however, the Applicants will address the references. In the current application, the Background Section states that:

“Suitable base materials used in GELVET®-type of applications and other similar applications are those materials that are compliant and yet strong, while ideal base materials are those materials that are not only compliant and strong, but also can be produced with a high degree of purity. Silicone is one of the best available polymers identified as a base material because of its compliant property and strength. However, it is well known that a considerable amount of volatile, low molecular weight components are present inherently as a consequence of the equilibrium polymerization utilized in silicon manufacture. Typically, silicones with viscosity below 50cSt are more than 10% volatile, while those with a viscosity greater than 50cSt are 0.5-4% volatile. After curing, liquid silicone monomers convert into a solid or semi-solid rubbery state polymer and the cross-linked network can then reduce the migration of liquid friction. Though a certain amount of monomers and oligomers will unavoidably escape out of the bulk base under the harsh burn-in conditions, resulting in an oily organic stain on the surface of IC chips. The

contamination not only cosmetically stains the chip surface but also degrades the chip's thermal performance after packaging. **So-called "space-grade" silicone has the least amount of low molecular weight oligomers by repeatedly distillation of industrial grade and accordingly is very expensive."** (emphasis added)

In the application, as mentioned, a coating material and/or composition has been developed that that a) has a low thermal resistance; b) is relatively free of oil contamination; c) makes a good coating composition; and d) can make a self-assembled physical barrier or interface between the underlying thermal interface material and additional components. Furthermore, the self-assembled physical barrier is formed inside the coating composition, utilizing a micro-filler and phase separation of two silicone based macro-monomers, which will subsequently be crosslinked to form a coating base. The at least two siloxane-based polymers of the current application should have two different solubility parameters. The two solubility parameters allow the at least two siloxane-based polymers to separate into two distinct phases before the crosslinking reaction takes place. None of the cited references teach this phase separation, despite what the Examiner reasonably believes about the compounds taught in those references. In addition, one of ordinary skill in the art will not read any of the cited references and come away with the knowledge that utilizing different solubility parameters to form two distinct phases will be desirable for a thermal interface material.

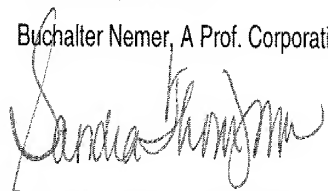
Therefore, claims 1 and 35 are patentable over Hanson in view of Matayabas. In addition, claims 16 and 50 are allowable as being dependant on allowable claims 1 and 35.

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Respectfully submitted,
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APPENDIX OF PENDING CLAIMS

1. (Previously Presented) A thermal interface composition, comprising:
at least two siloxane-based compounds, wherein each compound has a different solubility parameter,
at least one inorganic micro-filler material, and
at least one thermally conductive filler material.
2. (Previously Presented) The thermal interface composition of claim 1, wherein at least one of the siloxane-based compounds comprises a polysiloxane compound.
3. (Previously Presented) The thermal interface composition of claim 1, wherein at least one of the siloxane-based compounds comprises a hydride-functional siloxane compound.
4. (Previously Presented) The thermal interface composition of claim 2, wherein the polysiloxane compound comprises a substituted polysiloxane compound.
5. (Previously Presented) The thermal interface composition of claim 4, wherein the polysiloxane compound is substituted by a functional group comprising an alkyl group, an aromatic group, a halide group or combinations thereof.
6. (Previously Presented) The thermal interface composition of claim 4, wherein the substituted polysiloxane compound comprises an alkenyl-terminated polyalkylsiloxane.
7. (Previously Presented) The thermal interface composition of claim 6, wherein the alkenyl-terminated polyalkylsiloxane comprises a vinyl group.
8. (Previously Presented) The thermal interface composition of claim 7, wherein the alkenyl-terminated polyalkylsiloxane further comprises a methyl group.
9. (Previously Presented) The thermal interface composition of claim 5, wherein the polysiloxane compound comprises vinylmethycyclotetrasiloxane,

polytetradecylmethylsiloxane, polyoctylmethylsiloxane, decylmethylsiloxane, butylated aryloxy-propylmethylsiloxane, octadecylmethylsiloxane, dimethylsiloxane or combinations thereof.

10. (Previously Presented) The thermal interface composition of claim 3, wherein the hydride-functional siloxane comprises methylhydrosiloxane.
11. (Previously Presented) The thermal interface composition of claim 1, wherein the inorganic micro-filler material comprises silicon dioxide.
12. (Previously Presented) The thermal interface composition of claim 1, wherein the inorganic micro-filler material comprises a powder.
13. (Previously Presented) The thermal interface composition of claim 1, wherein the inorganic micro-filler material comprises a flake.
14. (Previously Presented) The thermal interface composition of claim 1, wherein the thermally conductive filler material comprises a transition metal.
15. (Previously Presented) The thermal interface composition of claim 1, wherein the thermally conductive filler material comprises boron.
16. (Previously Presented) The thermal interface composition of claim 14, wherein the transition metal comprises copper.
17. (Previously Presented) The thermal interface composition of claim 15, wherein the thermally conductive filler material comprises boron nitride.
18. (Previously Presented) The thermal interface material of claim 1, further comprising at least one additive.
19. (Previously Presented) The thermal interface material of claim 18, wherein the additive comprises a catalyst.
20. (Previously Presented) The thermal interface material of claim 18, wherein the additive comprises an inhibitor.

21. (Previously Presented) The thermal interface material of claim 18, wherein the additive comprises a rheological modifier.
22. (Previously Presented) The thermal interface composition of claim 19, wherein the catalyst comprises platinum.
23. (Previously Presented) The thermal interface composition of claim 20, wherein the inhibitor comprises an antioxidant.
24. (Previously Presented) The thermal interface composition of claim 21, wherein the rheological modifier comprises at least one solvent.
25. (Previously Presented) A coating composition comprising the thermal interface composition of claim 1.
26. (Previously Presented) A coating composition comprising the thermal interface composition of claim 18.
27. (Previously Presented) An electronic component comprising the thermal interface composition of claim 1.
28. (Previously Presented) An electronic component comprising the thermal interface composition of claim 18.
29. (Previously Presented) An electronic component comprising the coating solution of claim 25.
30. (Previously Presented) An electronic component comprising the coating solution of claim 26.
31. (Previously Presented) A semiconductor component comprising the thermal interface composition of claim 1.
32. (Previously Presented) A semiconductor component comprising the thermal interface composition of claim 18.

33. (Previously Presented) A semiconductor component comprising the coating solution of claim 25.
34. (Previously Presented) A semiconductor component comprising the coating solution of claim 26.
35. (Previously Presented) A method of forming a thermal interface material, comprising:

providing at least two siloxane-based compounds, wherein each compound has a different solubility parameter,

providing at least one inorganic micro-filler material,

providing at least one thermally conductive filler material, and

combining the at least two siloxane-based compounds, the at least one inorganic micro-filler material and the at least one thermally conductive filler material.
36. (Previously Presented) The method of claim 35, wherein at least one of the siloxane-based compounds comprises a polysiloxane compound.
37. (Previously Presented) The method of claim 35, wherein at least one of the siloxane-based compounds comprises a hydride-functional siloxane compound.
38. (Previously Presented) The method of claim 36, wherein the polysiloxane compound comprises a substituted polysiloxane compound.
39. (Previously Presented) The method of claim 38, wherein the polysiloxane compound is substituted by a functional group comprising an alkyl group, an aromatic group, a halide group or combinations thereof.
40. (Previously Presented) The method of claim 38, wherein the substituted polysiloxane compound comprises an alkenyl-terminated polyalkylsiloxane.
41. (Previously Presented) The method of claim 40, wherein the alkenyl-terminated polyalkylsiloxane comprises a vinyl group.

42. (Previously Presented) The method of claim 41, wherein the alkenyl-terminated polyalkylsiloxane further comprises a methyl group.
43. (Previously Presented) The method of claim 39, wherein the polysiloxane compound comprises vinylmethylcyclotetrasiloxane, polytetradecylmethylsiloxane, polyoctylmethylsiloxane, decylmethylsiloxane, butylated aryloxy-propylmethylsiloxane, octadecylmethylsiloxane, dimethylsiloxane or combinations thereof.
44. (Previously Presented) The method of claim 37, wherein the hydride-functional siloxane comprises methylhydrosiloxane.
45. (Previously Presented) The method of claim 35, wherein the inorganic micro-filler material comprises silicon dioxide.
46. (Previously Presented) The method of claim 35, wherein the inorganic micro-filler material comprises a powder.
47. (Previously Presented) The method of claim 35, wherein the inorganic micro-filler material comprises a flake.
48. (Previously Presented) The method of claim 35, wherein the thermally conductive filler material comprises a transition metal.
49. (Previously Presented) The method of claim 35, wherein the thermally conductive filler material comprises boron.
50. (Previously Presented) The method of claim 48, wherein the transition metal comprises copper.
51. (Previously Presented) The method of claim 49, wherein the thermally conductive filler material comprises boron nitride.
52. (Previously Presented) The method of claim 35, further comprising at least one additive.

53. (Previously Presented) The method of claim 52, wherein the additive comprises a catalyst.
54. (Previously Presented) The method of claim 52, wherein the additive comprises an inhibitor.
55. (Previously Presented) The method of claim 52, wherein the additive comprises a rheological modifier.
56. (Previously Presented) The method of claim 53, wherein the catalyst comprises platinum.
57. (Previously Presented) The method of claim 54, wherein the inhibitor comprises an antioxidant.
58. (Previously Presented) The method of claim 55, wherein the rheological modifier comprises at least one solvent.
59. (Previously Presented) A coating composition produced from the method of claim 35.
60. (Previously Presented) A coating composition produced from the method of claim 52.
61. (Previously Presented) An electronic component comprising the coating solution of claim 59.
62. (Previously Presented) An electronic component comprising the coating solution of claim 60.
63. (Previously Presented) A semiconductor component comprising the coating solution of claim 59.
64. (Previously Presented) A semiconductor component comprising the coating solution of claim 60.

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EVIDENCE APPENDIX

There is no additional evidence at this time of which the Applicant's are aware.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings at this time of which the Applicant's are aware.